

## CLAIMS:

1. A method for processing sound signals for a surround left channel ( $S_L$ ) and a surround right channel ( $S_R$ ), wherein a continually varying delay between the resulting signals of the surround right ( $S_R$ ) and surround left channels ( $S_L$ ) is generated.
- 5 2. A method according to claim 1, wherein the continually varying delay is generated so that the signals of the left and right surround channels ( $S_L$ ,  $S_R$ ) are decorrelated at all times.
3. A method according to claim 1 or 2, wherein the left surround channel ( $S_L$ ) and the right surround channel ( $S_R$ ) are each split into a number of frequency bands ( $B_1$ ,  $B_2$ , ...,  $B_n$ ,  $B'_1$ ,  $B'_2$ , ...,  $B'_n$ ), and each frequency band ( $B_1$ ,  $B_2$ , ...,  $B_n$ ,  $B'_1$ ,  $B'_2$ , ...,  $B'_n$ ) of each surround channel ( $S_R$ ,  $S_L$ ) is delayed with respect to other frequency bands ( $B_1$ ,  $B_2$ , ...,  $B_n$ ,  $B'_1$ ,  $B'_2$ , ...,  $B'_n$ ) of the same channel ( $S_R$ ,  $S_L$ ), and also with respect to a corresponding frequency band ( $B'_1$ ,  $B'_2$ , ...,  $B'_n$ ,  $B_1$ ,  $B_2$ , ...,  $B_n$ ) of the other channel ( $S_L$ ,  $S_R$ ).  
10
4. A method according to any of claims 1 to 3, wherein the surround left channel ( $S_L$ ) and the surround right channel ( $S_R$ ) are mixed with other sound channels ( $F_R$ ,  $F_L$ ,  $C$ ) and forwarded to a number of loudspeakers ( $L1$ ,  $L2$ ,  $L3$ ,  $R1$ ,  $R2$ ,  $R3$ ) in such a way as to yield sound output signals ( $A_1$ ,  $A_2$ ,  $A_3$ ,  $A_4$ ) with a directional arrangement of dipole loudspeaker lobes ( $DL_1$ ,  $DL_2$ ,  $DL_3$ ,  $DL_4$ ,  $DL_5$ ,  $DL_6$ ).  
15 20
5. A method according to any of claims 1 to 3, wherein the delayed surround channels ( $S_L$ ,  $S_R$ ) are stored together with associated sound ( $F_R$ ,  $F_L$ ,  $C$ ,  $B$ ) and/or video channels in a storage media for later use.  
25
6. A delay management unit (1) for a surround right channel ( $S_R$ ) and a surround left channel ( $S_L$ ) of a stereo surround channel ( $S$ ) with a number of variable delay units ( $D_1$ ,  $D_2$ , ...,  $D_n$ ,  $D'_1$ ,  $D'_2$ , ...,  $D'_n$ ) to provide a continually varying delay between the signals of the surround right channel ( $S_R$ ) and the surround left channel ( $S_L$ ).

7. A delay management unit (1) according to claim 6, comprising variable delay units ( $D_1, D_2, \dots, D_n, D'_1, D'_2, \dots, D'_n$ ) in each surround channel ( $S_L, S_R$ ) and a control signal generator (6) with control signal outputs ( $C_1, C_2, \dots, C_n, C'_1, C'_2, \dots, C'_n$ ) connected to the variable delay units ( $D_1, D_2, \dots, D_n, D'_1, D'_2, \dots, D'_n$ ) in such a way as to yield the continually varying delay.
8. A delay management unit (1) according to claims 6 or 7, comprising:
- a frequency splitting arrangement for the left surround channel ( $S_L$ ) and for the right surround channel ( $S_R$ ) to split each channel into a number of frequency bands ( $B_1, B_2, \dots, B_n, B'_1, B'_2, \dots, B'_n$ );
  - variable delay units ( $D_1, D_2, \dots, D_n, D'_1, D'_2, \dots, D'_n$ ) for the different frequency bands ( $B_1, B_2, \dots, B_n, B'_1, B'_2, \dots, B'_n$ ) in the surround right channel ( $S_R$ ) and the surround left channel ( $S_L$ ) and
  - a control signal generator (6) for generating control signals ( $C_1, C_2, \dots, C_{n-1}, C'_1, C'_2, \dots, C'_{n-1}$ ) to control the variable delays ( $D_1, D_2, \dots, D_n, D'_1, D'_2, \dots, D'_n$ ) in such a way as to delay each frequency band ( $B_1, B_2, \dots, B_n, B'_1, B'_2, \dots, B'_n$ ) of each surround channel ( $S_L, S_R$ ) with a continually varying delay with respect to other frequency bands ( $B_1, B_2, \dots, B_n, B'_1, B'_2, \dots, B'_n$ ) of the same channel ( $S_L, S_R$ ), and with respect to a corresponding frequency band ( $B'_1, B'_2, \dots, B'_n, B_1, B_2, \dots, B_n$ ) of the other channel ( $S_R, S_L$ ).
9. A delay management unit (1) according to claim 7 or 8, where the control signal generator (6) comprises a signal source (G) and a signal modifier arrangement ( $M_1, M_2, \dots, M_{n-1}$ ) which together provide control inputs ( $C_1, C_2, \dots, C_{n-1}, C'_1, C'_2, \dots, C'_n$ ) for the delay units ( $D_1, D_2, \dots, D_n, D'_1, D'_2, \dots, D'_n$ ).
10. A sound processing system (2, 2') comprising a delay management unit (1) according to any of claims 6 to 9.
11. An acoustic system (3), said system comprising:
- a source of a number of distinct sound channels (F, S, C, B) including a surround left channel ( $S_L$ ) and a surround right channel ( $S_R$ );
  - an sound processing system (2) according to claim 10 for processing the sound channels (F, S, C, B);

- and a number of loudspeakers (L1, L2, L3, R1, R2, R3) for converting the processed sound channels (A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>) into audible sound;

12. An acoustic system (3) according to claim 11, where the number of  
 5 loudspeakers (L1, L2, L3, R1, R2, R3) are arranged to form an array and where the sound processing system (2) comprises a mixing unit (4) for mixing sound input channels (F, S, C) to give sound output channels (A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>), and forwarding sound output channels (A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>) to the loudspeakers (L1, L2, L3, R1, R2, R3) in such a way as to yield a directional arrangement of dipole loudspeaker lobes (DL<sub>1</sub>, DL<sub>2</sub>, DL<sub>3</sub>, DL<sub>4</sub>, DL<sub>5</sub>, DL<sub>6</sub>) for the sound  
 10 input channels (F, S, C, B).

13. A mixing unit (4) for a sound processing system (2) with a number of distinct sound channels (F, S, C) including a surround left channel (S<sub>L</sub>) and a surround right channel (S<sub>R</sub>) comprising:  
 15 - line inputs (100, 200, 300) for the sound channels (F, S, C);  
 - line outputs (101, 201, 301) for connection to loudspeakers (L1, L2, L3, R1, R2, R3);  
 - a means for mixing the sound channels (F, S, C) to give sound output channels (A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>) in such a way as to yield a directional arrangement of dipole loudspeaker lobes  
 20 (DL<sub>1</sub>, DL<sub>2</sub>, DL<sub>3</sub>, DL<sub>4</sub>, DL<sub>5</sub>, DL<sub>6</sub>) and forwarding the sound output channels (A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>) to the line outputs (103, 203, 303);  
 - a delay management unit (1) according to any of claims 6 to 9 to generate a continually varying delay between the surround right and surround left channels (S<sub>R</sub>, S<sub>L</sub>).

25 14. A mixing unit (4) according to claim 13, comprising a user-configurable delay arrangement (5) for delaying the signals of the different sound channels (F<sub>R</sub>, F<sub>L</sub>, S<sub>R</sub>, S<sub>L</sub>, C) with respect to each other in such a way as to direct dipole loudspeaker lobes (DL<sub>1</sub>, DL<sub>2</sub>, DL<sub>3</sub>, DL<sub>4</sub>, DL<sub>5</sub>, DL<sub>6</sub>) for at least some of the sound channels (F<sub>R</sub>, F<sub>L</sub>, S<sub>R</sub>, S<sub>L</sub>, C) by choosing suitable delay scale values.

30

15. A studio system comprising a sound processing system (2') according to claim 10.

16. A computer program product directly loadable into the memory of a programmable sound processing system (2, 2') comprising software code portions for performing the steps of a method according to claims 1 to 5 when said product is run on the sound processing system (2, 2').

5

17. A memory medium storing a data file comprising sound and/or video channels including surround sound channels delayed using a method according to any of claims 1 to 5.